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**Declaration under Rule 4.17:**

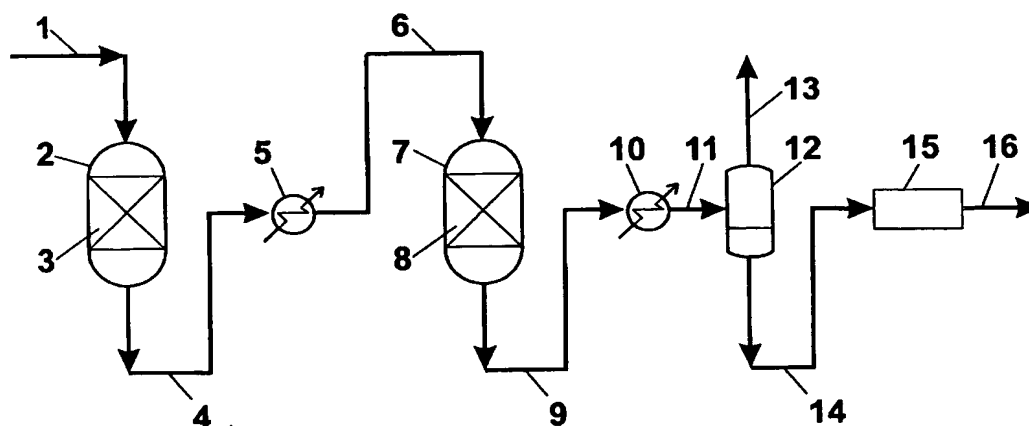
— of inventorship (Rule 4.17(iv)) for US only

**Published:**

— with international search report  
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: PROCESS FOR SYNTHESIS OF METHANOL



(57) Abstract: The invention provides a process for production of methanol from a feed stream rich in hydrogen carbon monoxide and carbon dioxide. The feed stream is converted to a converted process stream comprising methanol and small amounts of higher alcohols, aldehydes and ketones in the presence of a catalyst active in conversion of hydrogen and carbon monoxide into methanol. The converted process stream is cooled to a cooled process stream to 20-200°C. The cooled process stream is hydrogenated into a hydrogenated process stream rich in methanol and depleted in aldehydes and ketones in presence of a hydrogenation catalyst. The catalyst is active in conversion of aldehydes and ketones into alcohols in a process stream rich in methanol and further comprising hydrogen, carbon monoxide and carbon dioxide. The hydrogenated process stream is cooled to a cooled, condensed process stream, and subsequently the cooled, condensed process stream is separated into a gas phase and a liquid crude methanol phase.



**(88) Date of publication of the international search report:**  
14 October 2004

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/13942

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C07C29/151 C07C31/04 B01J23/72 //F02C3/28

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C07C B01J F02C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal, CHEM ABS Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	US 6 723 886 B1 (ALLISON JOE D ET AL) 20 April 2004 (2004-04-20) claims 1-10	1-9
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Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

### ° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

4 June 2004

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Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/13942

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 682 002 A (METALLGESELLSCHAFT AG) 15 November 1995 (1995-11-15) claims 1-10; figure 1 ---	1-9
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A	WO 99 03807 A (ABBOTT PETER EDWARD JAMES ;ICI PLC (GB)) 28 January 1999 (1999-01-28) claims 1-5 ---	1-9
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP 03/13942

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claim : 2 and part of 1

directed to a process for the production of methanol,  
wherein the converted process stream is cooled to 80-150C.

2. Claim : 3 and part of 1

directed to a process for the production of methanol,  
wherein the hydrogenation (1-c) takes places in a separate  
reactor.

3. Claim : 4 and part of 1

directed to a process for the production of methanol,  
wherein the hydrogenation (1-c) takes places in a single  
reactor.

4. Claim : 5 and part of 1

directed to a process for the production of methanol,  
wherein the hydrogenation (1-c) takes places in a tubular  
reactor.

5. Claims: 6-7 and part of 1

directed to a process for the production of methanol,  
wherein the hydrogenation catalyst is Cu bases catalyst.

6. Claim : 8 and part of 1

directed to a process for the production of methanol,  
wherein the hydrogenation catalyst is a noble metal based  
catalyst.

7. Claim : 9 and part of 1

and part of 1 directed to a process for the production of  
methanol, wherein the hydrogenation catalyst is in the form  
of pellets, extrudates, etc

The ISA has carried out a search which relates to inventions  
I-VII mentioned above.

The application, hence does not meet the requirements of  
unity of invention as defined in Rule 13.1 and 13.2 PCT.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 03/13942

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